April 1968

Brief 68-10124

# NASA TECH BRIEF



## Reliable, Self-Calibrating Vibration Transducer

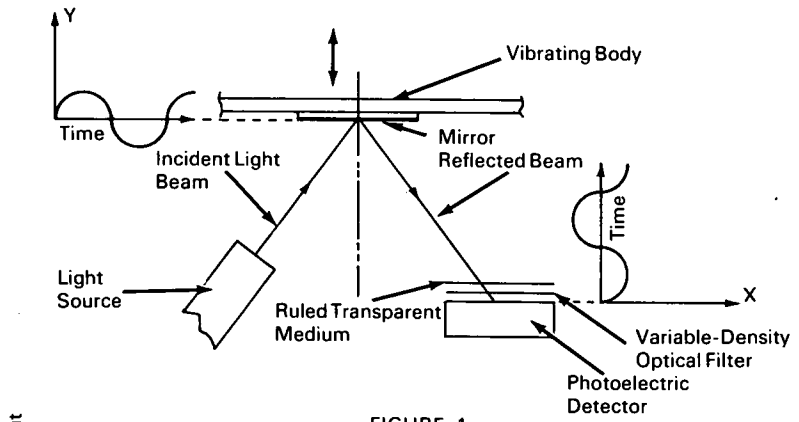


FIGURE 1

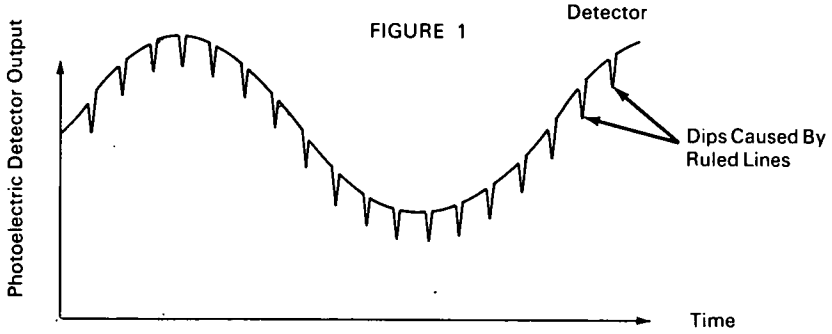


FIGURE 2

A highly reliable transducer system has been designed to measure the uniaxial vibration amplitudes (deflections) and frequency of a body subjected to mechanical vibration. The basic system is self-calibrating and provides an output which unambiguously indicates the direction as well as the magnitude of the uniaxial deflections. The transducer system comprises a light source, a small plane mirror mounted on the test body, and a sandwich arrangement consisting of (1) a transparent layer on which are uniformly spaced ruled lines having a predetermined opacity and width, (2) an optical filter whose optical density varies linearly with displacement of the reflected light beam, and (3) a photoelectric detector which produces a voltage or current proportional to the intensity of the reflected light beam penetrating the other two layers of the sandwich.

If the amplitude, Y, of the vibrating body varies sinusoidally with time (Figure 1), the light beam reflected from the mirror will sweep across the sandwich arrangement at a sinusoidal rate in the X direction. As a consequence, the intensity of the light passing through the variable-density optical filter and the corresponding output of the photoelectric

(continued overleaf)

detector will also vary sinusoidally. When the reflected light beam crosses one of the ruled lines on the transparent medium, the intensity of the beam decreases and causes a corresponding decrease or dip in the output of the photoelectric detector, as shown in Figure 2.

The vibration amplitude is calculated from the number of dips between a maximum and a minimum point on the sinusoid and the geometric parameters of the transducer setup. The vibration frequency corresponds to the cycles per second of the sinusoid.

**Note:**

Inquiries concerning this transducer system may be directed to:

Technology Utilization Officer
Langley Research Center
Langley Station
Hampton, Virginia 23365
Reference: B68-10124

**Patent status:**

This invention has been patented by NASA (U.S. Patent No. 3,364,813), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to NASA, Code GP, Washington, D.C. 20546.

Source: Royce L. McKinney
(LaRC-89)